

2.4 SIGNATURES IRST

Brawler models infrared signature in 4 different bands of the EM spectrum defined as follows:

Band 1	1.8 - 2.7	microns
Band 2	4.0 - 5.0	microns
Band 3	3.0 - 4.0	microns
Band 4	8.0 - 12.0	microns

Any comments which follow, unless otherwise specified, generally apply to each of these wavelength bands.

Computation of Signal

Before any computation of actual source signal is performed, conditions such as relative aspect, range, and target projected area are determined. Also included in these environmental calculations is the pressure averaged altitude between the target aircraft and the IR sensor attempting detection and a determination of background category based on whether the target is above or below the earth's horizon relative to the sensor (curved earth assumed).

Plume Radiation

Depending on which IR signature model is used, one of two methods is employed for determination of signal levels of the Plume, Airframe and Hot parts.

The first method uses a simple linear interpolation on pre-defined tables of temperature data which exist within the target aircraft's data deck. These tables are currently defined with respect to variables of Mach, altitude, and power setting which, combined with the environmental conditions established in serve to define the IR signature.

The other method calculates plume signature in different ways for different bands. For bands 1 and 2, correlations from the G.E. Pirep model are made. Bands 3 and 4 have their signatures determined from making curve-fits on multiple runs of the Aerodyne Airs program given atmospheric and engine operating conditions.

Black Body (Airframe) Radiation

The airframe radiation is calculated using Plank's equations and is then modified with respect to the presented area and emissivity.

Hot Part Radiation

In calculating the engine hot parts' radiation, projected areas are first calculated for each engine part (e.g. - turbine, case, nozzle, divergent flaps). Modifying for these projected areas, tables of temperatures for each engine part (defined in input data for each aircraft type) are employed in Plank's equation to arrive at a source signature in watts/steradian.

Reflected Solar Radiation

Reflected ambient solar radiation is calculated through table lookup in combination with modifications for sensor-target range, projected target area, and target altitude.

Reflected Sky Radiation

Same process as above except for ambient sky radiation.

Reflected Earth Radiation

Same process as above except for ambient earth radiation.

Compute Background

Background calculations are performed for target-sensor spatial separation adjusting for target projected area, emissivity, etc.

Compute Foreground

Foreground calculations are performed for target-sensor spatial separation adjusting for target projected area, emissivity, etc.

2.4.1 Functional Element Design Requirements

2.4.2 Functional Element Design Approach

Design Element 4-1:

2.4.3 Functional Element Software Design

2.4.4 Assumptions and Limitations

2.4.5 Known Problems or Anomalies